LESSONS ON LOGIC GIVEN TO A *PARENTS' REVIEW* SCHOOL CLASS.

Lesson I.

(The children's answers, where they are given, are inserted in square brackets. Where no answer is recorded, the reader may assume that the right one was given.)

"I went to buy some braid. The shopkeeper said it would cost a penny a yard, but I could have it cheaper by the dozen. What did she mean? What is a dozen?"—["A dozen inches." "A dozen yards."]

"Yes, but what does dozen mean?"—["Twelve."]

"Twelve what?"

"Are twelve anything a dozen?"

"Are twelve eggs a dozen?"

"Are twelve counters a dozen?"

"Well, now let us understand exactly what we are talking about. Mary, count out a dozen of these white counters on the table. Jane, put out twelve counters. Let us arrange the two sets in the same shape. Now, leave them there, and let us attend to something else."

"A man asked in a shop for something which was to cost sevenpence, and then for something else which was to cost eightpence. How much was he to pay altogether? What are seven and eight?"

"So he was to pay fifteen pence, was he? But he put on the counter four coins. What do you think those coins were?"—["A shilling and three pennies."]

"But what business has a man to pay four coins when he owes fifteen?"—["A shilling is twelve pence."]

"Then are twelve pence a shilling? Here is a heap of mixed coins. Mary, pick out a shilling and put it by your dozen counters. Jane, pick out twelve pence and put them by your twelve counters."

"Now here is something which does not seem very clear. Supppse I left this dozen counters on the table, and went

away for a few minutes, and somebody came into the room while I was away, and took my dozen counters and put down the twelve counters in its place, when I came back should I know that anyone had been meddling?"—[1. "You would if he put them in a different place." 2. "Or arranged them in a different pattern."]

"Or if I had put a private mark on my own dozen. But if I had put no mark, and the person was very careful to put his twelve counters in the same place as the dozen, and arrange them in the same pattern, I should not know that anyone had been in the room."

"Then there is no difference in the look of twelve counters and a dozen counters. Would they weigh differently in the scales?"

"Would they taste differently if I put them against my tongue? Is there any purpose for which I could use the dozen for which the twelve would not answer as well? But now, suppose I put a shilling on the table, and while I was away someone took the shilling, and put twelve pennies in its place, should I know, when I came back, that someone had changed them?"

"How should I know?"—[Several different answers were given about the difference in appearance.]

"So I should know the difference by the look, should I?"

"Now, suppose I put the shilling in one pan of the scales, and twelve pennies in the other, would they weigh the same?"

"I might use the silver of the shilling to make the bowl of a spoon to measure out acids for food. Suppose we used the metal of one of the pennies for that, would our health find out the difference?"

"Then you see that in every way we can think of twelve pennies are not like a shilling. Then why do you say that they are a shilling?"—["They are worth the same."]

"Worth, for what? They are not worth the same for making spoons of."

"What is the use of money?"—["To buy things with."]

"Then money is of no use at all in itself; it is only of use to exchange for other things?"

"And twelve pence are a shilling for just as long as we keep them not used, and only use them to exchange for other

things. Directly we begin to use the material itself for any other purpose, they are not like each other any more."

"What is this?"—["A weight."]

"What weight?"—["A pound."]

"No, look what is written on it."—[1. "1 oz. I don't know what that spells." 2. "An ounce."]

"If I wanted an ounce of caraway seeds I should put this weight in one pan of the scales, and take seeds enough to balance this weight, should I?"

"Well, a cook read in a receipt: take 8 oz. of sugar. Did she take eight weights like this and put in the pan of her scales?"—["No, she put one big weight."]

"What do you think was written on that big weight?"—[½ lb.]

"Then half a pound is eight ounces. What is a pound?"

"Then 16 oz. are 1 lb?"

"Now, supposing I had sixteen of these little weights, is there anything that could be done to them that would turn them into a pound weight?"—["Yes, they could be melted down into one lump."]

"And when they were in one lump we need not stamp 1 oz. on it sixteen times. One stamp would be put upon it; what would that be?"

"What did people do before they had money?"—[1. "They exchanged things." 2. "That must have been very awkward, though."]

"Yes, it was very awkward; that is why people invented money. But still, when they had not money they had to manage with exchange and barter as best they could."

"Suppose two men were stranded on a desert island now, they would have to do without money. Suppose that one of the men had succeeded in making nut trees grow, and the other had got a pear tree with a good crop, and they each thought they would like a change of food. One might say to the other, 'Give me some of your pears, and I will give you some of my nuts.' Then they would have to settle how many nuts were worth one pear; that would depend on the size of the pears. Suppose they decided that one pear was worth three nuts, then if the pear-grower handed over one pear, what would the other have to give?"

"And for two pears?"

"And for three pears?"

"And for four pears?"

"You think that would be a fair bargain? Just as it is fair to give twelve pennies for a shilling, so it is fair to give three nuts for a pear, and nobody is wronged, and the whole thing is quite fair and right?"

"Well now, suppose your governess found in one of your Nature Note-books, a sentence like this: 'I went into a wood. I found a hazel-nut tree. I picked off it four pears and three nuts.' What would she say?"—[A burst of laughter.]

"Well, but if you picked fifteen nuts, that might be the equivalent of four pears and three nuts, why should not you write it?"—[The children did not explain why, but their attention had been called to the fact that such a thing ought not to be written.]

"When you come to 15d. in a sum, do you ever write 1s. 3d. instead?"—["We *always* do."]

"And what does your governess say?"—["She never says anything."]

"Then she thinks it quite right to put 1s. for 12d. in a sum, and not right to put one pear for three nuts in a Nature Note-book?"

"But now here is something strange; nuts are much more like pears than pennies are like shillings, because if you were very hungry and had no food at all, it would not matter much to you whether you came to a nut tree or a pear tree; you could get something nice to eat off either. And then again, if your mother said to the cook: 'Send up some dessert for the children's dinner,' cook might send up pears one day and nuts another day; either is dessert. If a child happens to have something the matter, it might be forbidden to eat nuts for a time, but as a general rule people can eat which they please, and one is as good as the other for food. But you remember that we tried to make a spoon out of a penny instead of a shilling, and that would not do at all, somebody would get poisoned. Why then may you write in lessons 1s. instead of 12d., and may not write a pear instead of three nuts?"

"What is the use of your Nature Note-books?"

"To teach you to notice the botany of the things, the way they grow, the kind of flowers that come before certain fruits,

the kind of earth each sort grows in, whether they grow in woods or on hills. In all these ways the nut is not like the pear. But the use of doing money sums is to teach you about the money value of things, and *for that purpose*, and no other purpose, twelve pence *are* exactly the same as one shilling."

Lesson II.

"Has any little girl here got a pet?"—["I have a bird."]

"What kind of bird?"—["A canary."]

"I had a bird once; he was an owl; we had a pigsty cleaned out and whitewashed for it; he had a trunk of a tree for a perch; he was fierce at first, but we tamed him by smoking tobacco under his nose, which he did not seem to dislike; we fed him on raw beef and mice; when he liked he went away to the woods, and when he wanted to come home he hooted and screamed at our window till we let him in. He seemed very well and happy: so you will feed your canary on raw beef for the future, won't you?"—[A very emphatic "No."]

"Not when I tell you it suited my bird perfectly?"—["No."]

"Why not?"—["He is not the same kind of bird."]

"So that is what it depends on, is it: his being the same kind of bird?"

"Then suppose someone who was accustomed to breeding canaries came and told you what food suited his canaries, would you be careful to give your canary exactly all the kinds of seeds that he mentioned?"—[The owner of the canary seemed doubtful; perhaps she felt some distrust of allowing any stranger to interfere with her pet; but another child said: "I would."]

"Then you would treat your bird as had been found to suit birds of the same kind, but not as had been found to suit birds of a different kind. Is that it?"—["Yes."]

"Do you know what is meant by experience? Experience is the knowledge that we get, not from reading books, but from doing things and seeing how they answer. You trust experience: your own experience or somebody else's, when

the experience has been about the *same* kind of thing that you are going to have to do with, but not when it has been about a *different* kind of thing. Now, is that really what you mean?"—["Yes."]

"Do you know what a dragon-fly is?"

"Those of you who have not seen a dragon-fly, do you know what a gnat is?"

"Gnats and dragon-flies live in water when they are young; they are very nice pets to have, especially the great wrigglers. Suppose we had a dragon-fly in the room that we wanted to be kind to and take care of; and suppose somebody said: 'Why do you allow this dragon-fly to be out of water? It is the very *same* animal which was skimming about in the aquarium this morning; it has lived all its life in water; it has always seemed very happy and well; we have plenty of *experience* to show that water is what suits it; put it back into the water.' Would you put it into the water?"—["No."]

"Not when we have had experience of water suiting that very *same* animal? Why wouldn't you?"—["It is not the same kind of animal that it was in the morning."]

"You mean, then, that though it is the *same* animal that it was, it is not the same *kind* of animal that it was?"

"A very few years ago Mary was a little baby, a very happy, healthy little baby; she had no food but milk; it suited her perfectly and she throve on it. Shall we ask Mary's mother now to be very careful not to give her any food but milk, because she has experienced that milk without anything else suits Mary? Mary looks as if she would not much like that arrangement; I suppose Mary thinks that she is not quite the same *kind* of creature as she was six years ago, although she is the very same little Mary."

"Well, children, you have told me a good many things. Now I will tell you one thing: this is a very puzzling world, full of difficult problems; very many of the difficulties are made by the same words having more than one meaning, and by people not being quite sure in what sense they are using the word, or in what sense other people are using it. Therefore we save ourslves a good deal of trouble if we get into the way of making quite sure of what sense we are going to use a word in before we use it, and of finding out in what sense

other people were using words before we either answer them, or contradict them, or do as they advise."

MRS. M. E. BOOLE.

The above paper was written by me from Mrs. Boole's dictation. I wish I could reproduce in Mrs. Boole's own forcible words the side thoughts which such dictation brought forward. I think that perhaps the most emphasized thought was, that, though some may smile and say that such lessons as these are childish and unnecessary, in reality they tend to get the child's mind into the proper attitude for receiving scientific, and especially mathematical, teaching. To understand such abstract subjects as algebra, the child's mind should be prepared long beforehand by some such simple lessons as these; he must be taught to reason; to see the relation things bear to one another; to be able to distinguish between "likes" and "equals." When such an attitude of mind is established by early training, no difficulty will be experienced in putting before the child abstract ideas.

That some preliminary teaching is necessary will be readily acknowledged by all thoughtful teachers of any experience. If we attempt to explain the niceties of logical inference in the middle of an algebra lesson it interrupts the train of thought and confuses the pupil, and, moreover, the subject of the algebra lesson being abstract, it is very difficult to point out to the child where his mode of reasoning has been faulty; the habit of accurate inference should have been established long before, and in connection with objects already quite familiar to the child (*e.g.*, pennies, counters, gnats, and canary birds). If the habit is rightly established from the beginning, algebraic process will not need to be explained to the child, each when presented to him will take its place as the abstract expression of some mental process already quite familiar.

EDITOR.

OUR RECREATION.

THERE has been some disappointment among the Committee of the Students' Association on account of the failure to establish Magazine or other Reading Clubs among the members. Although I have joined a very small circle that was finally formed, I am not sure that, considering how constantly we are occupied with intellectual work, it is not wiser to devote as much as possible of one's spare time to other forms of recreation than that found in books. Our work alone, if we do it thoroughly, ought to provide us with sufficient mental food, for every subject suggests some fresh question, and every teacher at one time or another may be seen immersed in the inexhaustible *Britannica Encyclopædia*. One piece of fresh information gained per diem is not to be despised even from the point of view of the savant, or, as I suppose I should say, "savante." Work over, and lessons for the next day prepared, one feels a desire to explore fresh fields and pastures new, and these are not, as a rule, to be found within the pages of a novel (I grant, however, there are notable exceptions). There will only be time and space in this short paper to say a few words upon one form of recreation which is not often considered to rank among the amusements of life. I speak of Conversation. Far more exciting than a novel, for here the plots and characters unfolding before your eyes are real, it has the same fascination as a Nature Note-book or any other form of Art, for it is Nature's own facile method of self-expression. There are some people of high ideals who prefer to take the modest attitude of listener, and one is quite grateful to them if the room has brilliant talkers; these are, moreover, as a rule, very pleasant people to live with, but if they would make an effort to converse when the society is not so distinguished, they might benefit others, and would soon succumb themselves to the charm of convincing and being convinced. Argument is really a pleasure, and there is no form of teaching that is more effectual. It has been very truly said: what we cannot express we do not know; and after a long talk, in which it has been necessary to state one's views in proper examination